VSI Interconnect Hardware Specifications

The physical interface into the DIM and out of the DOM are structurally essentially the same by definition, so it is sufficient to describe an interconnect in terms of generic transmitting and receiving equipment, plus the cable assembly that joins them.

Physical Characteristics

The interface comprises 40 signals in LVDS differential format as defined by the basic standard ANSI/EIA/TIA-644 (hereafter '644). The connector type is 80-pin Mini D Ribbon (MDR) with sockets on both the transmitting and receiving equipment.

DAS-DIM	DOM-DPS	Pin(+)	Pin(-)
BS0	RBS0	1	2
BS1	RBS1	3	4
"	"	"	"
"	"	"	"
BS14	RBS14	29	30
BS15	RBS15	31	32
BS16	RBS16	42	41
BS17	RBS17	44	43
"	"	"	"
"	"	"	"
BS30	RBS30	70	69
BS31	RBS31	72	71
1PPS	R1PPS	33	34
-	ROT1PPS	35	36
PVALID	QVALID	37	38
CLOCK	RCLOCK	39	40
PCTRL	QCTRL	74	73
PDATA	QDATA	76	75
PSPC	QSPC	78	77
PSPD	QSPD	80	79

Table 1 : VSI Pin Allocations

This pinout is optimised for 'LVDS387/389 line driver chips, with the drivers for (R)BS0..(R)BS15 on the connector side of the PCB and for (R)BS16..(R)BS31 on the reverse. The opposite scenario applies for 'LVDS386/388 line receivers.

The cable assembly comprises 40-pair screened or 80-line multi-coax cable, terminated by metal shrouded plugs which continue full screening through to the connection plane. Corresponding shrouds on the equipment connectors directly ground the shield to their respective chasses.

The actual cable structure is not prescribed but it must be consistent with significant signal components out to one GigaHertz. The enveloping screen serves to prevent RFI and protect against EMI, tie ground potentials together at each end of the interconnect, and provide a return path for any unbalanced signal leakage.

Standard cable lengths are 5m, 10m and 20m.

Electrical Characteristics

To provide interconnectability each component of type transmitter, cable assembly and receiver must individually conform to a consistent set of performance specifications. In particular the cable, which behaves as a lowpass filter, will for a given technology and length be rated for a maximum VSI frequency, vis. 32, 64 or 128MHz. (Higher CLOCK rates are permitted but unlikely with this architecture.)

VSI Waveform Specifications

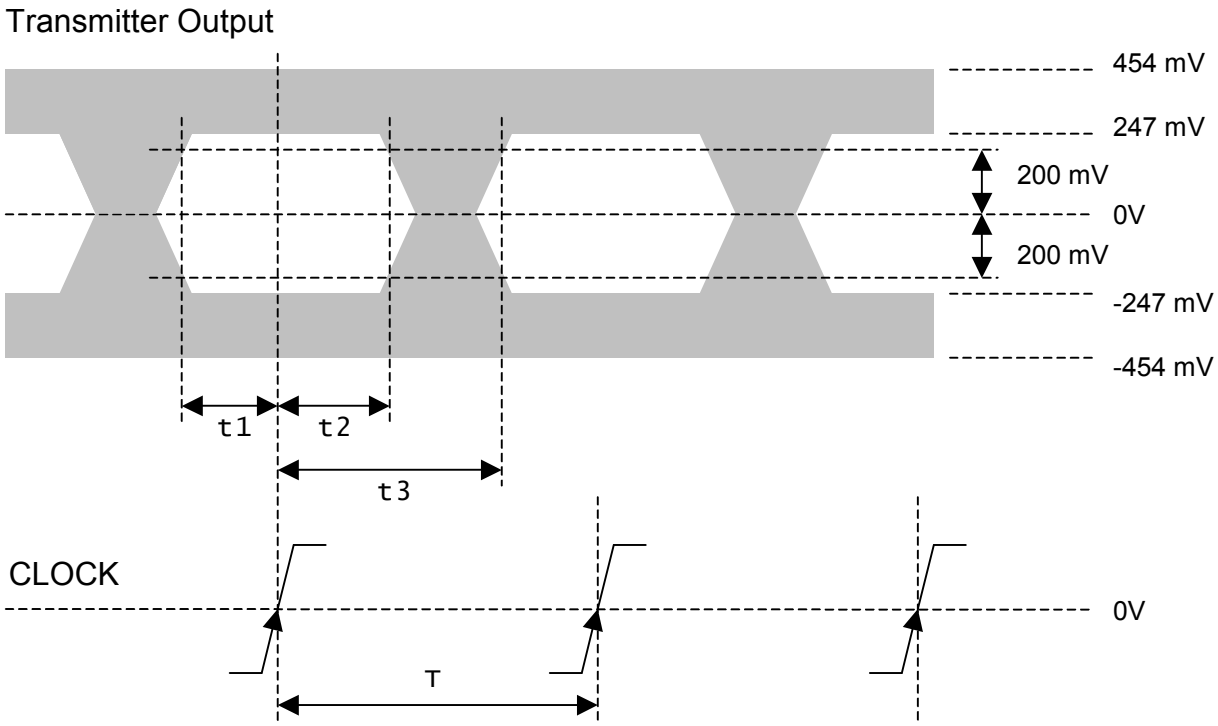

Figure 1 Transmitter Output Eye Pattern

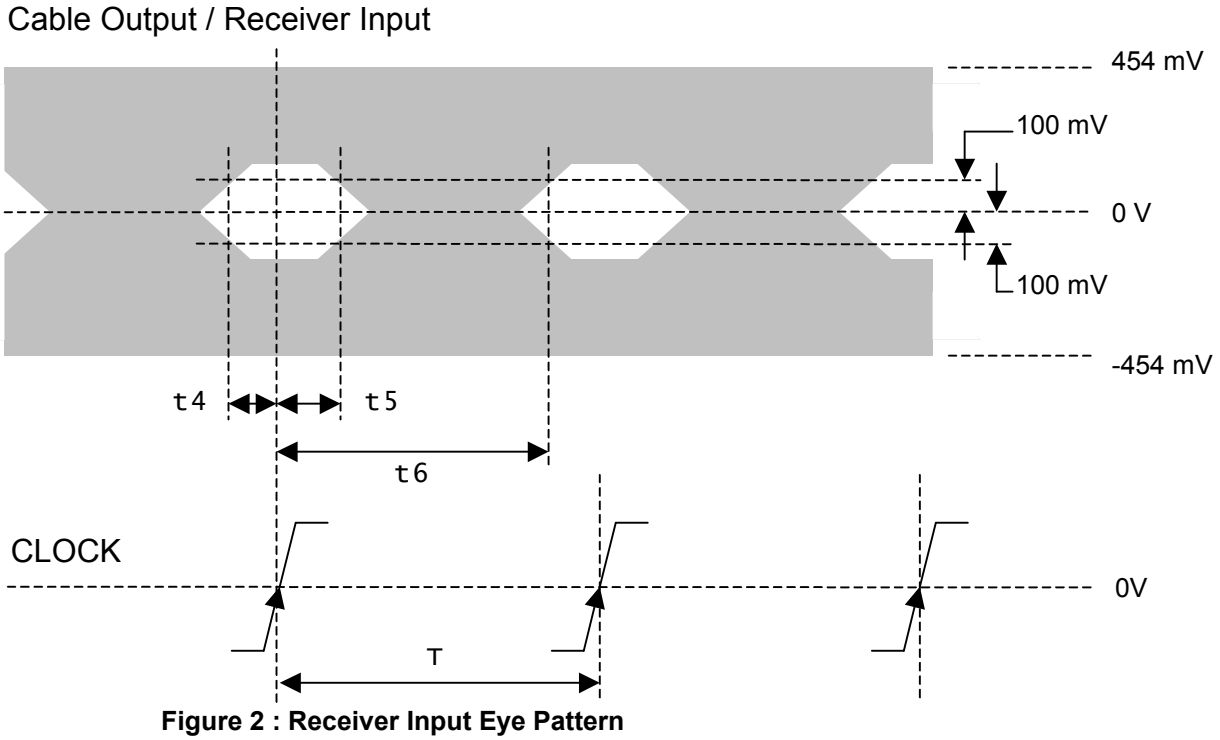

Figure 2 : Receiver Input Eye Pattern

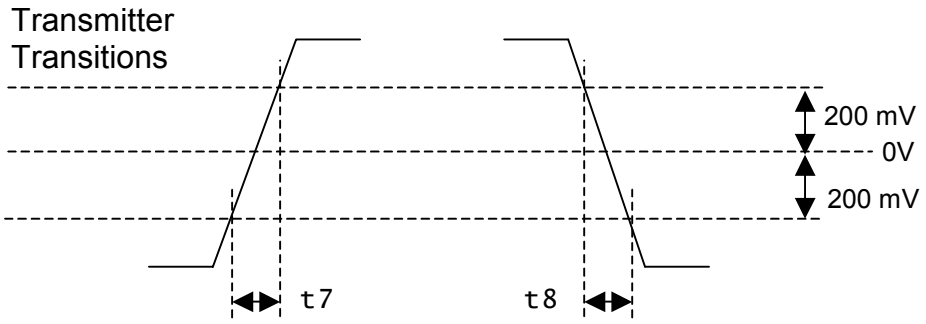

Figure 3 : Waveform Transition Definitions

Param.	Spec.	32MHz	64MHz	128MHz
T	1/CLOCK	31.3	15.6	7.8
t1	0.3T	9.4	4.7	2.3
t2	0.35T	10.9	5.5	2.7
t3	T-t1	21.9	10.9	5.5
t4	0.15T	4.7	2.3	1.2
t5	0.2T	6.3	3.1	1.6
t6	T-t4	26.6	13.3	6.6
t7,t8	$\geq$ 0.25	0.25	0.25	0.25
t7,t8	$\leq$ 0.2T	6.3	3.1	1.6

Table 2 : Timing Specifications and Values (ns) at Rated Frequencies

VSI Transmitter Specifications

1. The transmitter will produce waveforms satisfying the transmitter output eye pattern and transitions in Figs. 1 & 3 when driving a Standard Termination (q.v.).
2. The default state of inactive signals is "1".
3. Pair to pair cross-talk : $\leq$ -40dB
4. See also Notes on Specifications below.

VSI Cable Specifications

1. When driven by any transmitter conforming to the transmitter output eye pattern in Figure 1 the cable assembly will deliver waveforms satisfying the receiver input eye pattern in Figure 2, into a Standard Termination.

   This formal specification is difficult to verify on such a wide interface so the following five indirect specifications may be substituted.
2. Differential (odd-mode) characteristic impedance (pair) : 100Ω ±10%
3. Pair to pair skew : $\leq$ 0.1T
4. Rise time degradation : $\leq$ 0.1T
5. Attenuation : $\leq$ 9dB at f = 1/T
6. Pair to pair cross-talk : $\leq$ -40dB over 0.5/T < f < 5.5/T

7. Aggregate cross-talk : $\leq$ -30dB over 0.5/T < f < 5.5/T
8. Rated frequencies : 32MHz, 64MHz & 128MHz

VSI Receiver Specifications

1. Line termination (pair) : 100Ω ±5%.
2. Return loss (pair) : -20dB over 0.5/T < f < 5.5/T
3. Line receivers will fail-safe to state "1" when disconnected.
4. The receiver will respond correctly to incident waveforms satisfying the receiver input eye pattern in Figure 2.

Notes on the Specifications

1. Specification planes are the external connector on the transmitting equipment, the far end of the connecting cable, and the external connector on the receiving equipment.
2. All waveforms are net differential voltages measured across 100Ω resistors.
3. The timing reference for all measurements is the positive zero crossing of CLOCK monitored at that same point in the interface.
4. For the purposes of qualification all lines should be actively driven with their normal signals. The VSI TVG is an appropriate data source for the BS_n. Any unallocated lines should be paired up with a BSn.
5. The amplitude and transmitter transition time specifications apply to all waveforms on the Interface.
6. The full set of timing specifications apply to all BSn and xPPS signals, and the trailing edge of CLOCK.
7. If a secondary clocked data stream is transmitted on the unallocated lines then it will be subject to the same specifications as the BSn.
8. Secondary '644 electrical characteristics V_{OS}, ΔV_{OD}, ΔV_{OS}, I_{SC}, I_{IN} and V_{IN} apply to all lines.
9. The '644 t_R/t_F specifications are replaced by `t7` and `t8` as defined in Figure 3.
10. Cross-talk is measured by driving one line pair at the transmitter end of the cable while the other lines remain open circuit. Signal levels are monitored on a Standard Termination at the receiver end.
11. Cross-talk is relative to the direct signal at the same point in the interface.
12. Aggregate cross-talk is rms sum of 39 pairs to one pair.

Measurement Procedures

1. Monitoring with medium to high-impedance differential probes is preferred, but differencing pairs of single ended channels where the 'scope so provides is possible so long as probe compensation is well matched.
2. Probe and 'scope bandwidth should be > 10/T.
3. During end-to-end tests the sending and receiving chasses/grounds should **not** be joined except via the unbundled VSI cable. n.b. Test equipment may be grounded at only one end or the other. Ground coupling via mains cables may be prevented by ferrite rings or a standard LISN when available.
4. Standard Terminations comprise 100Ω ±1% resistors soldered directly onto appropriate connectors.
